

## CLAIMS

AMENDED CLAIMS FILED April 24, 2002

1. A crankless engine including one or more cylinder and piston groups disposed in or on a rotating member, the longitudinal axis of the one or more cylinder and piston groups being at a rim of the rotating member and orientated tangential to the rim of the rotating member, both the cylinders and pistons rotate continuously relative to a stationary part of the engine and wherein the piston(s) reciprocate at both top and bottom centres.
2. A crankless engine including:
  - a rotatable member,
  - one or more cylinders disposed around the circumference of the rotatable member, the longitudinal axes of the cylinders being at a rim of the rotatable member and extending tangential to the circumference of the rotatable member; and
  - one or more pistons, each piston associated with a corresponding cylinder,the engine being characterised in that each piston is associated with a piston lever pivoted eccentric to the rotatable member and wherein movement of each piston at top and bottom dead centres is controlled such that combustion energy is transmitted to the rotatable member by the cylinder moving away from the piston.
3. A crankless engine as claimed in claim 2 wherein movement of each piston is controlled independently of rotation of the rotatable member.
4. A crankless engine as claimed in claim 2 ~~or claim 3~~ wherein the piston is engaged, either directly or via a connection rod, to the distal end of the piston lever, the proximal end of the piston lever being manipulated to control movement of the piston relative to the cylinder.
5. A crankless engine as claimed in claim 2 wherein one or more piston controllers are disposed adjacent the proximal end of the piston lever, the proximal end of the piston lever being adapted to movably engage a surface or edge of the piston controller and communicate movement to the piston lever.

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6. A crankless engine as claimed in claim 5 wherein only one piston controller is disposed concentric to the rotatable member, the piston controller being a cylindrically shaped disk having one or more lobes on its circumferential surface.
7. A crankless engine as claimed in claim 5 (~~or claim 6~~) wherein the piston controller is rotationally independent of the rotatable member.
8. A crankless engine as claimed in claim 5 (~~or claim 6~~) wherein the piston controller is rotated in the opposite direction to the rotatable member.
9. A crankless engine as claimed in claim 5 wherein the piston controller is utilised to control the time that the pistons spend at the either end of their stroke.
10. A crankless engine as claimed in claim 2 wherein an energy stroke delivered to the rotatable member is longer than a combustion stroke of the piston.
11. A crankless engine as claimed in claim 2 wherein a compression stroke assists in supplying rotational energy to the rotatable member.
12. A crankless engine as claimed in claim 5 wherein the proximal ends of piston lever from two or more diametrically opposed pistons are joined or linked so that excursion of a piston on an compression stroke assists the excursion of a diametrically opposed piston on a compression stroke.
13. A crankless engine as claimed in claim 12 wherein one or more weights are associated with the one or more piston levers, centrifugal force acting on the weights to aid excursion of the pistons within the cylinders.

14. A crankless engine as claimed in claim 5 wherein substantially all of the force exerted in movement between the cylinders and pistons is along the longitudinal axis of the cylinders thereby reducing the effect of cylinder bore side thrust.
15. A crankless engine as claimed in claim 5 wherein the force generated at the cylinders is delivered directly to an output shaft without the intervention of any other mechanical parts.

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